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Rotary Rocket Company comments also are attached as a Word 97 file.

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Comments to the Notice of Proposed Rule Making for Commercial Space Transportation Reusable Launch Vehicle and Reentry Licensing  
Docket No. FAA-1999-5535; Notice No. 99-04  
Rotary Rocket Company

At Rotary Rocket we have opted to keep our comments to the NPRM brief and focused on the primary issue we that have with the structure and content of these proposed rules ? we firmly disagree with the use of operational restrictions in the regulation of reusable launch vehicles.

The proposed rules have a main body of fact-based standards that protect the public from harm, yet they also offer ?operational restrictions? that have no factual or analytical basis.

These operational restrictions are open-ended and undefined, such that RLV developers have no rational approach to satisfying them. To explain our position clearly we have focused on two of the operational restrictions that we believe should be eliminated:

1. A prohibition against operational RLVs flying over cities for more than a few seconds, regardless of how safe the vehicles are.
2. A requirement that all initial flights of an RLV must be assumed to have a 100% failure rate when over ?populated? areas, regardless of the actual likelihood of a mishap, or they must avoid flying over ?populated? areas for any ?substantial? number of seconds. The catch is that both ?populated? and ?substantial? are explicitly left undefined by the FAA.

These proposals are arbitrary on their face, since they saddle developers with standards that are not based on the reliability of the vehicle. Their presence will invite the addition of further ?analysis-free? rules over time as regulators attempt to hold space vehicle development to standards that no other human activity is required to meet.

#### Discussion

As noted, the main body of the proposed regulations mandates that any potential harm to the public, expressed as the expected number of casualties per flight, be extremely unlikely. Each vehicle is to be judged by the total risk to the entire population that it would overfly on the way to and from orbit.

Yet the ?operational restrictions? have no analytical or statistical basis. They are basically word games, where the words are not even defined. The two main problem areas are:

431.43(d)

This portion forbids launch companies with new vehicles from flying over any undefined ?populated? areas for an undefined ?substantial? number of

seconds unless the RLV would meet expected casualty limits with a 100% failure rate when over these undefined ?populated? areas. To avoid the 100% failure rule, launch companies must fly alternate routes over undefined ?unpopulated? areas.

Once FAA regulators step into fantasy zones where vehicles have a 100% probability of failure and operators must avoid areas that the FAA can't describe, there is no way to limit the regulatory risk faced by developers.

For example, with a 100% probability that all conceivable failures will actually happen, the area allegedly at risk below the vehicle will be huge -- potentially thousands of square miles. This results because all along the ground track, the possible descent trajectories will be widely dispersed due to the dozens of possible failure scenarios that must be assigned 100% probability of occurrence. This includes continued but suddenly off-target thrust, or winds lofting a largely empty vehicle in directions other than a straight ballistic curve. With such huge areas allegedly at risk, there are no ?safe? trajectories to and from orbit that can be flown from the United States.

A partial solution is to provide a definition for ?failure? that is limited to a single safety-critical system at a time -- the most severe failure that logically could happen from second to second along the ground track, rather than all failures that even remotely could happen from second to second. This is the only way to avoid an infinite compounding of potential failures: What if the engines suddenly vectored the vehicle onto an unsafe trajectory AND the fuel shutdown valves didn't work AND the fuel dump procedure failed AND the pilots both died of heart attacks before they could trigger any further mitigation measures? As written, there is nothing to stop regulators from envisioning such a scenario and requiring an RLV operator to fly a trajectory that would prevent ground casualties despite compound failures.

The best solution is to stick with making the most accurate possible estimates of probable failures and their consequences. If the result meets the Ec standard, the vehicle should be allowed to fly.

431.43(c)(2)

For ?proven? vehicles that have graduated from flight tests, the proposed rules allow only brief overflights of ?densely populated? areas, but unlimited time above ?populated? areas. This section plainly states that the people who live in ?densely populated? areas are far more valuable than the people who live in mere ?populated? areas. The rule says it is OK to cause ?significant? casualties in a populated area, but not in a ?densely populated? area. There's no logic in the rules to explain why people who live in big cities are more valuable than those who live in small cities and towns; logic takes a holiday once arbitrary gimmicks like this one are allowed into Federal regulation.

This rule could have the perverse effect of requiring RLVs to fly over many ?populated? areas to avoid one ?densely populated? city, and cumulatively a greater number of people could be exposed to risk than if the RLV over flew the city.

The rule's other perverse effect is to infect the RLV regulations with standards that have no basis in logic or experience. Once infected,

additional logic-free rules will be more likely to spring up.

The solution is to stick with the best possible estimates of probable failures and their consequences. If the result meets the Ec standard, the vehicle should be allowed to fly.

#### Something Further to Consider

All safety regulations, regardless of industry, have increasing cost as their severity increases. RLV regulations that prevent the development a cost-effective U.S. launch industry will have enormous costs that are ignored in these proposed rules.

For example, failure to develop RLVs will leave the American public exposed to the real danger that advanced missile technology will be developed abroad. China recently gained access to sophisticated American failure analysis techniques because U.S. satellite makers had gone offshore looking for affordable launchers. When Chinese launchers misfired, U.S. satellite manufacturers stepped in to improve the Chinese ability to analyze these failures. As a result, a hostile foreign power is now better equipped to send nuclear warheads into American cities.

In another example, the medical benefits of advanced pharmaceutical research and production in microgravity likely will be enormous, saving countless lives through better therapies discovered or manufactured in space. These advances have been put on hold by the high costs of existing launch vehicles. The low costs of RLVs are crucial to initiating this new era of advanced medicines, but the public won't get these benefits if the proposed operational restrictions kill RLV development.


Environmental monitoring is another field in which low launch costs would enable a great advance in public health and safety. Orbital monitors can spot leaks of hazardous materials from tanks and pipelines, and allow farmers to apply agricultural chemicals precisely just to limited areas that need them?vastly reducing the public health risks from overuse of pesticides, herbicides and fertilizers.

Therefore, all the feel-good gimmicks in the RLV regulations come with real costs. Technology transfers to hostile states, lack of life-saving space-developed pharmaceuticals, and environmental damage from chemicals are just a few of them. Demanding an unobtainably high level of RLV safety actually will put Americans at greater risk than if RLVs were allowed to develop under fact-based rules.

Comments submitted by:

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July 1999

  
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